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Energy study of the atmosphere subjected to the influence of squall lines in the sahelian zone using a radiative transfer model

ABSTRACT

The study of the atmosphere under the influence of convective system type squall line (SL) in the Sahelian zone is more important. In this climate zone, where most of the population derives their income from agricultural activities, squall lines are the source of most of the precipitation. We performed a composite analysis of radiosounding data and the model output. The composite analysis here is the cutting time of the dynamic system (SL) associated with atmospheric and meteorological parameters and averaged radiative or in the time class. If the phenomenon we are trying to describe a physical reality, the results of all the averages show a coherent structure. We carry out climatology of an atmosphere subjected to 334 passages squall line of 38 consecutive years (1968-2006) and radiosounding data. The composite analysis showed that the squall lines are systems with a coherent structure.

They are composed of two parts: a convective (wind shift between the two and after detection of the disturbance) and another known as layered as Statiform part described by some authors. The radiosoundings are used as input data for the radiative transfer model MODTRAN version 4 revision 3. The spectral model with a resolution of wavelengths ranging from thermal infrared (IR) to ultraviolet (0.2 to 10000.0 μm) through the visible, calculate the diffusion flux and luminance. The outputs of the model subjected to statistical analysis allowed to identify a spectral signature of each category related to a class time. The spectral signatures of the atmosphere reveal a significant difference of structures obtained in the comparison of atmospheric diffusion flux for the different temporal classes. MPM Liebe model that we adapted to our analysis, allowed us to determine the average profiles of the atmosphere radiances under the influence of squall lines. By combining the two models (MODTRAN AND MPM) and by combining them with satellite sounders we showed it was possible to carry out sounding troposphere through neural networks.

Keywords : **Modtran, Squall Line, Radiance, Radiosounding**